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A QUANTITATIVE ANALYSIS OF
MOLLUSCAN COLLECTIONS
FROM
ISLA ESPÍRITU SANTO,
BAJA CALIFORNIA, MEXICO

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On a reconnaissance trip to Espíritu Santo Island, made November 1, 1959, we noticed, as we waded ashore at Candelerio Bay, an unusual concentration of fine drift shells. About three pounds of the material was brought back for sorting. From this, plus the larger shells picked up during a moderately low tide that day, there resulted a total count of nearly 200 molluscan species, which at the time seemed indicative of a very rich fauna offshore.

A second trip to the area in August, 1960, yielded living specimens of *Berthelinia*, a bivalved gastropod (Keen and Smith, 1961), as well as several other obviously new species, adding to the conviction that more intensive work should be done here.

A longer survey was undertaken in December, 1960, under the auspices of the California Academy of Sciences and the Belvedere Scientific Fund. Facilities were provided both for shore collecting and for dredging. The party consisted of Dr. Robert C. Miller of the California Academy, Dr. and Mrs. Ira Wiggins of Stanford University, Drs. Antonio Garcia Cubas and Alejandro Vil-

lalobos Figueroa, professors from the Instituto de Biología, University of Mexico, and myself. We spent nine days (December 12-21) aboard a barge anchored in El Cardonal, an embayment to the north of Candelero Bay -- technically on Isla Partida rather than on Isla Espíritu Santo proper.

DESCRIPTION OF THE AREA

Isla Espíritu Santo, about 12 miles long, lies some 20 miles north of La Paz, at $24^{\circ} 30'$ North Latitude, $110^{\circ} 30'$ West Longitude. It consists of two parts -- Isla Partida to the north and Espíritu Santo proper, the junction between being a narrow neck of land that is submerged at high tide. Both parts are of volcanic origin, composed of old lava flows and volcanic agglomerates forming east-west parallel ridges. The outer or eastern face rises steeply from the Gulf of California, and the land surface tilts at a low angle to the westward. Between the ridges on the western side are a number of tongue-shaped shallow bays that resemble drowned stream valleys. At the heads of most of these are beaches veneered with "coral" sand, consisting of broken fragments of organically derived calcium carbonate, intermixed with fine to coarse particles of volcanic tuffs. Some of the bays are extremely shallow and nearly level, depths being from a few inches to a few feet. Others have a deeper channel near the center. One of the latter sort is El Cardonal -- that being the name used on the U. S. Hydrographic Chart No. 1664 (24th edition, 1960) and in the Mexico and Central American Pilot (U. S. Hydrographic Office, edition 6, 1920), although it seems not to be used locally at present. In the field we

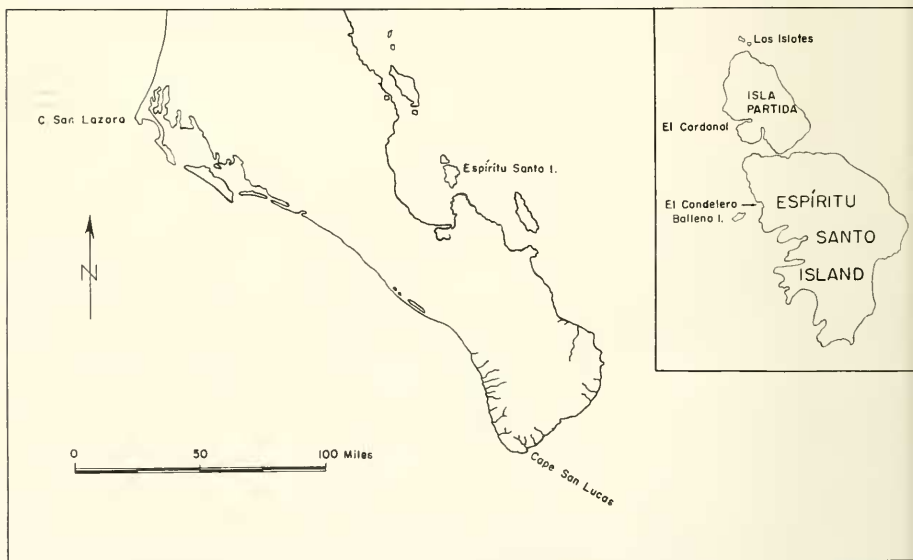


FIGURE 1. Generalized map of the southern end of Baja California, modified from Slevin (1923) and the U.S. Hydrographic Chart no. 1664.

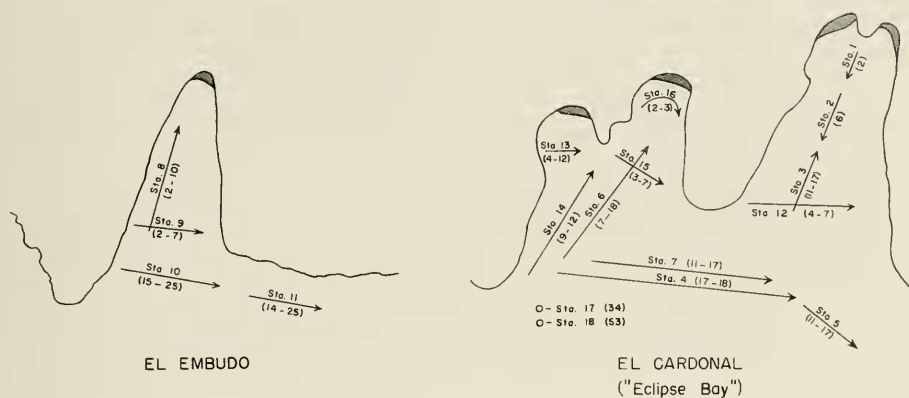


FIGURE 2. Dredging stations off Isla Partida. Sketch map drawn in the field by Dr. R. C. Miller. Directions of the 18 hauls are shown by arrows; depths, in fathoms are in parentheses, following station number. Dark-shading at the heads of embayments indicates areas of sand beaches.

adopted the name "Eclipse Bay," bestowed on this largest indentation of Isla Partida by an earlier Belvedere Scientific expedition.

There are no large-scale modern maps showing the area in detail. Most published maps (including the two given here) are only approximately correct. Figure 1 is modified from Slevin (1923)--a map originally drawn by Dr. G Dallas Hanna from an earlier version of the U. S. Hydrographic Chart cited above. Figure 2 is from a freehand sketch made by Dr. R. C. Miller in the field.

Two embayments on Isla Partida were sampled, El Embudo (The Funnel), toward the northern end, and El Cardonal, near the center of the west side. Candelero Bay, northernmost indentation on Espíritu Santo proper, lies to the south a distance of perhaps two to three miles. Being partially floored by non-coralline sediments, it may afford more varied ecologic conditions near shore, but offshore, the situation seems to be fairly uniform throughout the area.

The predominant material of the floor in El Cardonal is a sand composed of broken bits of coralline algae, hydrocorals, and such corals as *Cycloseris elegans* (Verrill), *C. mexicana* Durham, and *Porites* sp. The total biomass of living molluscan material is proportionately small. Even the total amount of dead shell material is scanty in comparison to a shallow-shelf dredging site near Guaymas, on the Sonora coast of Mexico, which I observed in August, 1960, with the *Ariel* Expedition.

Any sea floor area tends to be littered with a quantity of dead shell material, principally molluscan, that has accumulated over the past hundreds

or perhaps thousands of years from the predation of fish, crabs, and even other mollusks. At Espíritu Santo this dead rubble seems to be not so much molluscan as coralline. Living coral is reported by divers as occurring in deeper water. One gets the impression that in the not-too-distant past there was much more life here, for along the intertidal area and just below, the barnacles are dead, and although numbers of intact specimens of the sessile pelecypod *Pseudochama* were seen in Candelero Bay, we could not find a single living one. Possibly the conditions of 1959-1960 were temporary, the result of a red tide reported to us by Richard Adcock, local boat-owner, as having occurred a year or so previously. If so, the ecological situation may change within the next few years, when new populations replace the present dead remnants. In any case, there is evidence of a moderately rich though sparse molluscan fauna, as the graphs and table given below will show.

METHODS AND RESULTS

As the shore collecting added little to the list compiled in 1959, no separate analysis of this material is made here, but the 1959 list is given as list 2. One new species of the gastropod family Vermetidae, *Dendropoma*, new species B, was the principal novelty.

A total of 18 dredge hauls were made, and all of the hauls proved productive. Dredging was done from a converted Navy-surplus personnel landing craft owned by Richard Adcock, who had constructed a box at the stern to serve as preliminary sorting tray and a platform to hold the winch. An anchor-type winch with 1200 feet of three-sixteenths inch woven wire cable was used. The dredges were made of quarter-inch mesh hardware cloth, over metal frames measuring 5 by 16 by 24 inches. No dredges were lost, but one was so worn from hanging upon rocks and coral heads that the hardware cloth came apart. The cable could be wound on the winch by a hand crank but most of the time was raised by use of an electric hand drill applied instead of the crank, power being furnished by a gasoline-driven generator.

As each dredge load came in, it was emptied into a bucket in the wash-box and freed of unneeded rubble, such as pebbles. It was then washed through sieves of varying sizes and samples were kept of the promising materials in each or (if the hauls were small enough) of all material. These lots were then transferred to the field laboratory, a second Navy-surplus landing craft, converted for use as living quarters and large enough to accommodate our entire field party. Here, with the help of willing hands among the crew, the lots were scanned for molluscan material, dead or alive, for it was impracticable to transport the entire bulk lots back to California. All fragments of shells large enough for specific recognition were retained, to form the basis for this later quantitative analysis. Notes were kept, of course, on obviously live-taken material in each lot.

In order to complete the molluscan faunal picture in the Espíritu Santo area, a list of the chitons collected there intertidally at various times has been supplied by Allyn G. Smith and is included as list 5. Curiously enough, no chitons appeared in any of our dredge hauls. As data are not available on the occurrence of individuals of any species, the chitons are omitted from the faunal analysis.

In any quantitative analysis, a certain amount of grouping of the raw data is necessary to reveal trends. Here, grouping of the dredging stations in terms of depth and relative location seems most desirable. The 18 stations of list 3 can thus be reduced to five basic types:

A. Stations 1, 16 (2 to 3 fathoms, near upper end of bay).

B. Stations 2, 8-9, 12-15 (3 to 12 fathoms, slightly offshore).

C. Stations 3-7 (10 to 18 fathoms, near bay channel center).

D. Stations 10-11 (14 to 25 fathoms, near bay entrance).

E. Stations 17-18 (30 to 53 fathoms, off Isla Partida, outside entrance to "Eclipse Bay").

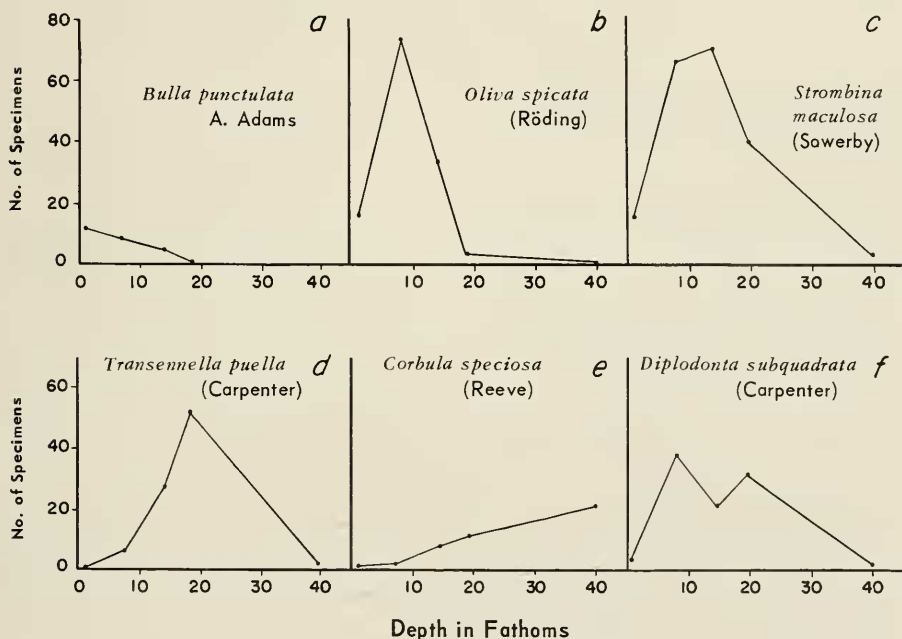


FIGURE 3. Analysis of abundance with depth for six representative species.

Although there seemed to be a paucity of material at any one station, surprisingly enough the total number of molluscan species identified in the

dredging amounts to 361: 208 gastropods, 146 pelecypods, and 7 scaphopods (list 4). This compares to 180 taken alongshore (intertidally or in drift) at Candelero Bay (136 gastropods, 41 pelecypods, and 3 scaphopods). Only 56 of the species are common to the two lists (31 gastropods, 22 pelecypods, and 3 scaphopods), which would suggest that most of the forms that wash ashore as drift live intertidally or very near shore and that little offshore material reaches the beach. Also (at least as far as this area is concerned), most of the forms that have adapted to intertidal existence on an arid tropical coast do not extend their range far offshore into deeper water.

To represent the picture as a whole, we might select for special scrutiny the ten species of gastropods and pelecypods, respectively, that had the highest counts of individuals. In list 1, below, the number of specimens and level of greatest concentration (in terms of the grouping indicated above) are given; an asterisk preceding the name means that living material occurred in at least one sample.

LIST 1

NAME	TOTAL NUMBER	MAXIMUM AT STATION GROUP
PELECYPODA		
* <i>Anadara multicostata</i> (Sowerby)	69	B
* <i>Glycymeris tessellata</i> (Sowerby)	109	D
* <i>Pecten vogdesi</i> Arnold	29	B
* <i>Aequipecten circularis</i> (Sowerby)	43	C
<i>Diplodonta subquadrata</i> (Carpenter)	99	B (also D)
* <i>Laevicardium elenense</i> (Sowerby)	303	B (also D)
* <i>Transennella puella</i> (Carpenter)	90	D
* <i>Megapitaria squalida</i> (Sowerby)	151	B
* <i>Chione undatella</i> (Sowerby)	49	B
* <i>Corbula speciosa</i> Reeve	44	E
GASTROPODA		
* <i>Turritella mariana</i> Dall	65	D
* <i>Hipponix grayanus</i> Menke	32	B
<i>Calyptrea mamillaris</i> Broderip	48	E (also C)
* <i>Polinices uber</i> (Valenciennes)	65	D
<i>Strombus gracilior</i> Sowerby	41	C
* <i>Strombina maculosa</i> (Sowerby)	193	C
* <i>Nassarius angulicostis</i> (Pilsbry and Lowe)	26	C
* <i>Oliva spicata</i> (Röding)	123	B
<i>Bulla punctulata</i> A. Adams	26	A

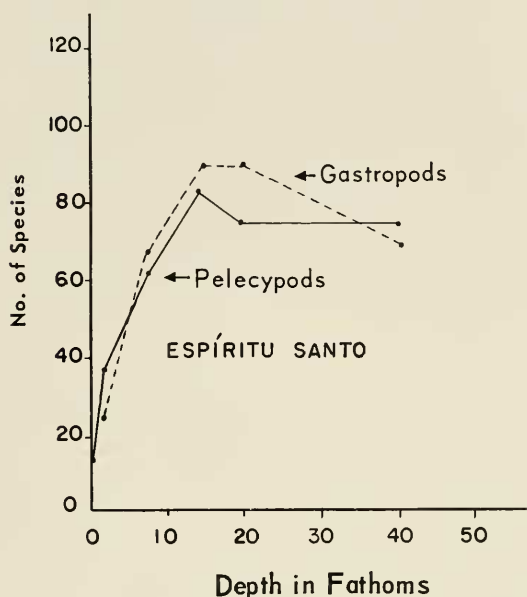


FIGURE 4. Relative abundance curves for pelecypod and gastropod species at the several stations, Espiritu Santo Island.

Plotting numbers of specimens against water-depth of occurrence, one sees that the distribution falls into six possible patterns, samples of which are shown in figure 3. Of the 20 selected species, only one, *Bulla punctulata*, has its maximum in the shallowest dredgings (less than 2 fathoms). Eight are most abundant at 3 to 12, 5 between that and 18, 4 between 14 to 25, and 2 between 30 to 50 fathoms. Three forms had a bimodal distribution, with one secondary peak of abundance, the significance of which can only be speculative until more observations are made. The distribution patterns otherwise seem remarkably consistent.

In examining the material collected, one gets the impression of sparseness, especially as compared to richer areas across the Gulf, as at Guaymas or Mazatlán. However, an inspection of the overall picture -- the total number of species present at each dredging level -- modifies this view somewhat. Figure 4 shows the number of pelecypod and gastropod species at the combined stations, a maximum of 80 pelecypod and 90 gastropod forms, which compares not too unfavorably with 120 pelecypod species recorded (in manuscript) by members of the *Ariel* expedition at Cabo Haro, off Guaymas, in 15 to 25 fathoms, and 115+ gastropod species (complete list not yet available). The species population at Espiritu Santo, therefore, is only moderately rich but very

thinly scattered, so that few individuals of any form are present in one spot. The paucity of other than coralline algae in the shallower waters perhaps accounts for the relative fewness of forms at depths of less than 7 fathoms. Beyond this the numbers of species present is surprisingly uniform to the greatest depth explored. In the intertidal area the number might increase with intensive collecting, for doubtless many forms were concealed beneath the larger rocks and in crevices. The number found alive in a single afternoon of collecting at low tide was not as great as even Group A of the dredgings (13 pelceypod and 23 gastropod species). This is again in harmony with the conclusion that the populations are thinly scattered. To recover all of the forms alive that are indicated by beach drift as present would require repeated forays.

CONCLUSIONS

From a single suite of data of the sort summarized here, one should not draw sweeping conclusions. Repeated samples from the same area, taken in the same way, might reveal changes of composition of the population. The same type of study done in nearby areas of slightly different ecology might bring out the effects of change in physical factors on the faunal components. For example, the infauna at some places along the Baja California coast must be astonishingly rich, especially in minute forms, for the intestine of a single large holothurian which I collected near Cape San Lucas contained 120 specimens of 33 species of mollusks -- some bivalves were still intact, and gastropods had opercula in place.

When enough comparative studies are made, we may have at hand a tool useful in the interpretation of the past history of the area. The molluscan fauna may well give clues as to the relationship of the Baja California land mass to the mainland and may even provide a commentary on the tantalizing suggestion that the tip of the peninsula once joined the mainland coast near the Tres Marias Islands, now being displaced northward some two to three hundred miles. This, of course, is for the future. From the present observations, however, some less profound deductions can be made.

Paleontologists are prone to conclude, if an assemblage is made up of disassociated bivalve shells or of worn fragments, that transportation from the original site is indicated. This may not necessarily be true. Inspection of a dredge haul reveals much fragmental and disarticulated material, even in situations beyond the influence of nearshore currents. The constant work of predators sifting the upper layers of the sea floor in search of prey and the accumulation of the discards after the mollusks have been found and consumed may result in large amounts of disorganized shell material that has not been moved more than a few inches. Could not, perhaps, the very occurrence in the fossil record of finely fragmented shells, with occasional intact specimens, actually be indication of an offshore deposit?

A second tentative conclusion is that under fairly uniform conditions, the offshore mollusks have a wide bathymetric range. The seafloor in a few fathoms depth presents an optimum habitat, but mollusks that occur in abundance there may range shoreward and seaward for some distance. Therefore, except for near-shore species and those with a known sharply limited niche, such as the requirement of highly oxygenated water, the numbers of individuals present in a given unit area may be a better index of depth than the numbers of species. Further sampling is needed, of course, to establish this principle. Certain forms are always indicative of intertidal conditions (the littorines, for example, or, in the tropics, the nerites). Others are always indicative of deep water, such as some of the turrids. For the in-between areas, however, and the assessment of relative depth for fossil assemblages, the use of some such measure as relative abundance might be very convenient if it can be demonstrated to be a trustworthy guide.

ACKNOWLEDGMENTS

I am deeply grateful to the administrators of the Belvedere Scientific Fund for the opportunity to do field work on Espíritu Santo Island and for the facilities made available there. The several members of two field parties, by their willing help, expedited both the collecting and the processing of material. At Stanford, assistance in identifying and analyzing material was given by two undergraduate students, Barry Roth and Eugene Coan. The graphs and maps used here were redrafted by Perfecto Mary, Technician, and that part of the manuscript dealing with physical conditions profited by criticism from Dr. William Taft, Research Assistant. My sincere thanks go to all of these people for their help.

LISTS OF MOLLUSCA AND DREDGING STATIONS

List 2. Intertidal molluscan fauna from drift at Candelero Bay, Espíritu Santo Island, November, 1959.

List 3. Dredging Stations. Extracted from the field notes of Dr. Robert C. Miller.

List 4. Mollusca dredged off Isla Partida, December, 1960.

List 5. *Polyplacophora* (Chitons) from Isla Espíritu Santo and Isla Partida, Baja, California, Mexico.

LIST 2. *Intertidal molluscan fauna from drift at Candelero Bay,
Espíritu Santo Island, November, 1959.*

In the following tabulations, total numbers of specimens collected are shown. An asterisk (*) preceding the number indicates that at least some individuals were alive when taken intertidally, and a number sign (#) preceding the name of the species that this is an extension of reported geographic range.

I have utilized here (as also in list 4) the new insights on classification reflected in papers by Taylor and Sohl (1962), Steinberg (1963), and Keen (1963); but where there is variance of opinion, as in Opisthobranchiata, some compromises are made. Arrangement within superfamilies is mainly alphabetical, with a few exceptions where it seemed desirable to keep family units intact.

PELECYPODA

SOLEMYACEA

Solemya panamensis Dall, 5

ARCACEA

Anadara multicostata (Sowerby), 3

Barbatia gradata (Broderip and Sowerby), 1

MYTILACEA

Hormomya adamsiana (Dunker), 10

Lithophaga aristata (Dillwyn), 1

Lithophaga spatiosa (Carpenter), 1

Septifer zeteki Hertlein and Strong, 4

PTERIACEA

Isognomon chemnitzianus (Orbigny), 4

Atrina tuberculosa (Sowerby), 1

Pinctada mazatlanica (Hanley), 1

Pinna rugosa Sowerby, 2

CARDITACEA

Cardita affinis californica Deshayes, *8

Condylocardia digueti Lamy, 12

LUCINACEA

Lucina (Callucina) lampra (Dall), 3

Lucina (Cavilinga) prolongata Carpenter, *100+

Lucina (Parvilucina) mazatlanica Carpenter, 2

Lucina (Pleurolucina) undatoides Hertlein and Strong, *10

Divalinga eburnea (Reeve), 1

Codakia distinguenda Tryon, *2

LIST 2. (Continued)

LUCINACEA (Continued)

Ctena chiquita (Dall), 1*Ctena mexicana* (Dall), 3

LEPTONACEA

#*Basterotia peninsularis* Jordan, 6*Mysella compressa* (Dall), 1

CHAMACEA

Chama species, juvenile, 2*Pseudochama panamensis* (Reeve), 8

CARDIACEA

Americardia biangulata (Broderip and Sowerby), 1*Laevicardium elenense* (Sowerby), 1

VENERACEA

Megapitaria squalida (Sowerby), 4*Transennella tantilla* (Gould), 100+*Chione* (*Timoclea*) *picta* Willett, 1*Chione* species, juvenile, 20*Protothaca grata* (Say), 1

TELLINACEA

Tellina (*Tellinella*) *cumingii* Hanley, 4*Tellina* (*Moerella*) new species, *6*Heterodonax bimaculatus* (Linnaeus), 5*Semele flavescens* Gould, 1*Cumingia lamellosa* Sowerby, 7

MYACEA

Corbula bicarinata Sowerby, 1

PANDORACEA

Cyathodonta undulata Conrad, 1

SCAPHOPODA

DENTALIIDAE

Dentalium quadrangulare Sowerby, 1*Dentalium semipolitum* Broderip and Sowerby, 6*Dentalium splendidulum* Sowerby, 4

GASTROPODA

PATELLACEA

Acmaea strongiana Hertlein, 10*Acmaea semirubida* Dall, 1

LIST 2. (Continued)

TROCHACEA

Tegula globulus (Carpenter), 1*Liotia acuticostata stearnsi* Dall, 4

FISSURELLACEA

Diodora alta (C. B. Adams), 2*Diodora saturnalis* (Carpenter), 3*Fissurella rugosa* Lamarck, 10

NERITACEA

Nerita funiculata Menke, 1*Nerita scabricosta* Lamarck, 1

LITTORINACEA

Littorina dubiosa penicillata Carpenter, 10*Littorina* species, 11*Lacuna* species, 1

RISSEOACEA

Alleorus deprellus Strong, 8*Cyclostremiscus trigonatus* (Carpenter), 20? *Solariorbis ditropis* Pilsbry and Olsson, 1*Teinostoma amplexans* Carpenter, 20*Teinostoma gallegosi* E. K. Jordan, 1*Alvania lirata* Carpenter, 50*Alvania tumida* Carpenter, 1*Alvania* species, 2*Barleeia alderi* (Carpenter), 10*Barleeia orcutti* Bartsch, 4*Assiminea translucens* (Carpenter), 1*Rissoella excolpa* (Bartsch), 1*Rissoella tumens* (Carpenter), 1*Rissoina burragei* Bartsch, 1*Rissoina mexicana* Bartsch, 15*Rissoina stricta* (Menke), 1*Rissoina woodwardi* Carpenter, 16

ARCHITECTONICACEA

Heliacus bicanaliculatus (Valenciennes), 4# *Heliacus chiquita* Pilsbry and Lowe, 2*Heliacus mazatlanicus* Pilsbry and Lowe, 1

CERITHIACEA

Alaba jeannettae Bartsch, *50*Alaba supralirata* Carpenter, 10

LIST 2. (Continued)

CERITHIACEA (Continued)

- Bittium cerralvoense* Bartsch, 1
Caecum 3 species, 30
Fartulum farcimen (Carpenter), 2
Micranellum 3 species, 8
Cerithiopsis abrejosensis Bartsch, 2
Cerithiopsis cassi Baker, Hanna, and Strong, 1
Cerithiopsis halia Bartsch, 1
Cerithiopsis subgloriosa Baker, Hanna, and Strong, 1
Cerithium maculosum Kiener, 20
Cerithium (*Liocerithium*) *sculptum* Sowerby, 100+
Litiopa melanostoma divisa Carpenter, 1
Metaxia convexa (Carpenter), 1
Seila assimidata (C. B. Adams), 10
Modulus disculus (Philippi), 1
Petaloconchus (*Macrophragma*) *macrophragma* Carpenter, *2
Serpulorbis margaritaceus (Chenu), *10

EPITONIACEA

- Epitonium bakhanstranum* Keen, 1
Epitonium hexagonum (Sowerby), 2
Epitonium species, 3

EULIMACEA

- Eulima linearis* (Carpenter), 1
Eulima mexicana (Bartsch), 2

HIPPONICACEA

- Hipponix pilosus* Deshayes, *7
Fossarus parcipictus Carpenter, 2
Fossarus species, 5

CALYPTRAEACEA

- Cheilea cepacea* (Broderip), 2
Crepidula aculeata (Gmelin), *5

LAMELLARIACEA

- Erato columbella* Menke, 5

NATICACEA

- Polinices uber* (Valenciennes), *4

TONNACEA

- Cymatium gibbosum* (Broderip), 1

LIST 2. (Continued)

MURICACEA

- Morula ferruginosa* (Reeve), 6
- Thais triangularis* (Blainville), 1
- # *Typhis* (*Tripterotyphis*) *lowei* (Pilsbry), 1

BUCCINACEA

- Mitrella ocellata* (Gmelin), 8
- Parametaria dupontii* (Kiener), 2
- Strombina maculosa* (Sowerby), 3
- Cantharus pallidus* (Broderip and Sowerby), 2
- Nassarius* (*Arcularia*) *tiarula* (Kiener), 4
- Nassarius* species, juvenile, 1
- Fusinus ambustus* (Gould), 5

VOLUTACEA

- Oliva spicata* Röding, *20
- Olivella alba* (Marrat in Sowerby), *115+
- Olivella dama* (Wood), 2
- Marginella californica* Tomlin, 2
- Marginella* (*Cystiscus*) compare *M. (C.) polita* Carpenter (?), 50

MITRACEA

- Mitra dolorosa* Dall, 8

CONACEA

- Clavus attalia* (Dall), 1
- Knefastia funiculata* (Kiener), 5
- Crassispira appressa* (Carpenter), 1
- Crassispira nymphia* Pilsbry and Lowe, 2
- Mangelia* (*Agathotoma*) *subdiaphana* (Carpenter), 25+
- # *Mangelia trichodes* Dall, 10
- Mangelia* (?*Kurtziella*) compare *M. (K.) dane* Dall, *1
- Mangelia*, species, 1
- Conus*, species, juvenile, 5
- Terebra* species, 10

PYRAMIDELLACEA

- Pyramidella* (*Longchaeus*) *adamsi* Carpenter, 4
- Pyramidella* (*Voluspa*) species, affinity with
P. (V.) auricoma Dall, *100
- # *Pyramidella* (*Pharcidella*) *hastata* A. Adams, 20
- # *Odostomia* (*Miralda*) *aepynota* Dall and Bartsch, 5
- Turbonilla*, 4 species, 24
- Iselica pura* (Carpenter), 5

LIST 2. (Continued)

BULLACEA

Atys casta (Carpenter), 3*Bulla punctulata* A. Adams, 5*Haminoea angelensis* Baker and Hanna, *25

SCAPHANDRACEA

Acteocina angustior Baker and Hanna, 5*Acteocina inculta* (Gould and Carpenter), 100+*Cylichna defuncta* Baker and Hanna, 1

SIPHONARIACEA

Trimusculus stellatus (Sowerby), 1

ELLOBIACEA

Melampus species, 1*Pedipes liratus* Binney, 2

JULIACEA

Berthelinia chloris belvederica Keen and Smith, 1*Julia thecaphora* (Carpenter), 3¹

APLYSIACEA

Dolabella californica Stearns, 1

Undetermined gastropods, 6 species, 10 specimens

1. Mr. A. A. Olsson has pointed out to me (written communication, September 18, 1960) that the earliest valid name for this form, which has been called *J. exquisita* Gould, 1862, and *J. equatorialis* Pilsbry and Olsson, 1944, by authors, was proposed by Carpenter (Mazatlán Catalogue, 1857, p. 533) as *Smaragdinella thecaphora*, in family Philinidae. The type locality is Mazatlán.

LIST 3. *Dredging Stations*. Extracted from the field notes of Dr. Robert C. Miller

STATION No.	LOCATION	DEPTH (FEET)	TIME (MIN.)	BOTTOM
1.	South arm of "Eclipse Bay."	13	10	Coralline algal sand, December 13, 1960.
2.	Continuation of no. 1.	34 to 39	10	Similar bottom, with a few rocks and coral heads.
3.	Starting near entrance of South arm, dredging toward inner end of bay.	100 to 65	10	Finer sand of same type; cor- alline algae, mostly <i>Lithothamnion</i> .
4.	Across entrance to "Eclipse Bay,"	110 to 105	10	Small haul, bottom apparent- ly sand and shell, smooth, with small bushy brown algae; a number of <i>Turritella</i> noted.
5.	Mouth of "Eclipse Bay," from end of no. 4, above, due south toward east end of Ballena Island.	105 to 65	10	Rocky bottom, the haul termin- ating by the dredge being caught on a rock.
6.	North side of "Eclipse Bay," from entrance in toward middle arm.	105 to 40	10	Dredge filled with coralline and shell sand, few animals.
7.	Across "Eclipse Bay," parallel to no. 4, but closer to shore.	approx. 100 to 66	20	
8.	El Embudo, from entrance toward beach at its head.	60 to 12	6	Sand bottom, many coral- lines. December 14, 1960.
9.	El Embudo, across channel inside.	13 to 43	5	Haul terminating by dredge being caught on a rock. Bottom similar to no. 8.
10.	El Embudo, off entrance, from north to south or southwest, parallel to shore.	approx. 100 to 150	6	Rocky bottom, haul ending with dredge caught on a rock, with little in it.
11.	Continuation of no. 10, southward along head- land.	150 to 83	12	Same as above.

LIST 3. (Continued)

STATION No.	LOCATION	DEPTH (FEET)	TIME (MIN.)	BOTTOM
12.	Across entrance to south arm of "Eclipse Bay."	start at 22 to 45 end 35	5	Bottom of sand that packed hard in dredge but with rocks that sometimes jerked cable. December 16, 1960.
13.	Across entrance to north arm of "Eclipse Bay."	25 to 48	6	Bottom of coarse sand and corallines that did not pack.
14.	"Eclipse Bay," from outer headland toward middle arm.	73 to 55	--	Coralline and sand bottom that did not pack; dredge only about $\frac{1}{3}$ full, most of sand apparent-washing out, with more coral heads than at any other station. (? <i>Porites</i> , both whitish and reddish, clumps 4-8" in diam.)
15.	"Eclipse Bay," across entrance to middle arm.	start at 20 to 45 end 35	10	Bottom of sand that packed so hard it had to be washed out with water.
16.	"Eclipse Bay," semi-circular haul off beach of main arm.	start at 15 to 10 end 16	8	Bottom of coarse sand and broken corallines that did that did not pack, also numerous white branching corals.
17.	Across mouth of "Eclipse Bay," about $\frac{3}{4}$ mile seaward from north headland (not shown on map).	est. 200	5	Very small haul, dredge coming up with metal bridles crossed in front. December 20, 1960.
18.	Continuation of no. 17, $\frac{1}{2}$ mile west of south headland marking outer boundary of "Eclipse Bay" (not shown on map).	est. 315	15	Fine coralline mud.

LIST 4. *Mollusca dredged off Isla Partida, December, 1960*

In the following tabulation a number sign (#) before a species name signifies an extension of reported range; an asterisk (*) before the number of specimens indicates some were alive when collected.

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
SOLEMYACEA					
<i>Solemya panamensis</i> Dall		4		1	
NUCULACEA					
<i>Nucula declivis</i> Hinds		1	3		
<i>Nucula exigua</i> Sowerby			3		4
# <i>Nucula schencki</i> Hertlein and Strong				1	
<i>Nuculana marella</i> Hertlein and Strong					3
<i>Nucula elenensis</i> (Sowerby)			*14		26
ARCAEA					
<i>Arca mutabilis</i> (Sowerby)					8
<i>Arca pacifica</i> (Sowerby)			4	16	4
<i>Barbatia alternata</i> (Sowerby)					1
<i>Barbatia gradata</i> (Broderip and Sowerby)	1				
<i>Barbatia lurida</i> (Sowerby)		1	1	2	1
<i>Barbatia reeveana</i> (Orbigny)				2	
<i>Anadara concinna</i> (Sowerby)			2	5	3
<i>Anadara multicostata</i> (Sowerby)	5	*35	*25	2	2
<i>Anadara reinharti</i> (Lowe)		1			1
<i>Glycymeris gigantea</i> (Reeve)		1			1
<i>Glycymeris multicostata</i> (Sowerby)		1			
<i>Glycymeris tessellata</i> (Sowerby)		2	*61	*80	26
<i>Glycymeris tessellata canoa</i>					1
Pilsbry and Olsson					
# <i>Nucinella subdola</i>					
(Hertlein and Strong)			2		2
MYTILACEA					
<i>Amygdalum pallidulum</i> (Dall)			*6	3	
<i>Crenella divaricata</i> (Orbigny)			4	1	7
<i>Gregariella coarctata</i> (Carpenter)				1	
<i>Modiolus americanus</i> (Leach)		1		1	
<i>Septifer zeteki</i> Hertlein and Strong	2	7	2	3	4
<i>Solamen columbianum</i> (Dall)			1		1

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
PTERIIACEA					
<i>Pteria sterna</i> (Gould)				1	
OSTREACEA					
<i>Ostrea fisheri</i> Dall	1	3	1	1	
<i>Ostrea</i> species, juvenile				1	
PECTINACEA					
<i>Pecten sericeus</i> Hinds				1	
<i>Pecten vogdesi</i> Arnold	2	*13	*6	7	1
<i>Aequipecten circularis</i> (Sowerby)	4	*8	*17	14	2
<i>Chlamys lowei</i> (Hertlein)		1	4	31	15
<i>Cyclopecten pernomus</i> (Hertlein)		1	1	10	9
<i>Lyropecten subnodosus</i> (Sowerby)		1		4	4
<i>Lima tetrica</i> Gould			1		
<i>Lima hemphilli</i> Hertlein and Strong			2	2	3
<i>Plicatula inezana</i> Durham					3
<i>Plicatula penicillata</i> Carpenter					1
<i>Spondylus princeps</i> Broderip				11	1
ANOMIACEA					
<i>Anomia peruviana</i> Orbigny				2	
<i>Placunanomia cumingii</i> Broderip				1	1
ASTARTACEA					
<i>Crassatella gibbosa</i> Sowerby			*5	3	2
<i>Crassinella pacifica</i> (C.B. Adams)			7	5	1
<i>Crassinella varians</i> (Carpenter)					14
<i>Tellidorella cristulata</i> Berry					17
CARDITACEA					
<i>Cardita affinis</i> Sowerby		7			7
<i>Cardita crassicostata</i> (Sowerby)				1	14
<i>Cardita megastropa</i> (Gray)		1	3	3	2
<i>Condylocardia digueti</i> Lamy	1				
LUCINACEA					
<i>Lucina (Bellucina) cancellaris</i>					
Philippi	3	3			2
<i>Lucina (Callucina) lampra</i> (Dall)	1	1	1		

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
LUCINACEA (Continued)					
<i>Lucina (Cavilinga) prolongata</i> Carpenter	1	7			
<i>Lucina (Luciniscia) liana</i> (Pilsbry)	1	5	3		39
<i>Lucina (Parvilucina) approximata</i> (Dall)		1			
<i>Lucina (Parvilucina) mazatlanica</i> Carpenter		2			
<i>Lucina (Pleurolucina) leucocymoides</i> (Lowe)			6	21	9
<i>Lucina (Pleurolucina) undatoides</i> Hertlein and Strong	2	6	2		
<i>Anodontia edentuloides</i> (Verrill)		1	6	2	2
<i>Codakia distinguenda</i> (Tryon)	1	5			
<i>Ctena chiquita</i> (Dall)	1	6	30	15	5
<i>Ctena mexicana</i> (Dall)	10	16	3	1	1
<i>Divalinga eburnea</i> (Reeve)		19	3	2	
<i>Miltha xantusi</i> (Dall)		1	1	1	
# <i>Thyasira</i> species			1		2
<i>Diplodonta inezensis</i> (Hertlein and Strong)		1	3		
<i>Diplodonta obliqua</i> Philippi			2		1
<i>Diplodonta sericata</i> (Reeve)				1	
<i>Diplodonta subquadrata</i> (Carpenter)	6	38	21	32	2
LEPTONACEA					
? <i>Axinopsida</i> species					8
<i>Aligena cokeri</i> Dall				1	
<i>Basterotia peninsularis</i> Jordan		1			
<i>Kellia suborbicularis</i> (Montagu)		1	1		
<i>Mysella chalcedonica</i> (Carpenter)		1			
<i>Orobitella chacei</i> (Dall)					2
<i>Orobitella stearnsii</i> (Dall)	1				
<i>Solecardia eburnea</i> Conrad	1	4	2	1	1
# <i>Lasaea</i> species	1				
Genus and species undetermined					1
CHAMACEA					
<i>Chama squamuligera</i> Pilsbry and Lowe	1		1	11	28

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
CHAMACEA (Continued)					
<i>Chama</i> species		2	1		1
# <i>Pseudochama corrugata</i> (Broderip)				3	
# <i>Pseudochama panamensis</i> (Reeve)		1			
<i>Pseudochama saavedrai</i>	1			1	
Hertlein and Strong					
CARDIACEA					
<i>Laevicardium elenense</i> (Sowerby)	*19	183	40	58	3
<i>Lophocardium annettae</i> (Dall)			2	3	
<i>Nemocardium pazianum</i> (Dall)			3	3	24
<i>Papyridea aspersa</i> (Sowerby)			1	1	
<i>Trachycardium consors</i> (Sowerby)	1	34		1	
<i>Trachycardium belcheri</i>					
(Broderip and Sowerby)			13	*13	1
<i>Trigoniocardia biangulata</i>	*9	5	4	2	3
(Broderip and Sowerby)					
VENERACEA					
<i>Chione compta</i> (Broderip)	*3	*12	5	1	2
<i>Chione mariae</i> (Orbigny)			2	1	*4
<i>Chione picta</i> Willett	1		1		
<i>Chione undatella</i> (Sowerby)		*37	6	6	
<i>Cyclinella singleyi</i> Dall			1	1	
<i>Gouldia californica</i> Dall	1	4	11	3	11
<i>Megapitaria squalida</i> (Sowerby)	*30	*70	*41	8	2
<i>Pitar frizzelli</i> Hertlein and Strong				1	
<i>Pitar newcombianus</i> (Gabb)		4	*13	2	
# <i>Pitar perfragilis</i> Pilsbry and Lowe					6
<i>Pitar pollicaris</i> (Carpenter)			1		
<i>Protothaca grata</i> (Say)	1				
<i>Transennella puella</i> (Carpenter)		6	*28	53	3
<i>Transennella sororcula</i>	1			1	
Pilsbry and Lowe					
<i>Transennella tantilla</i> (Gould)		9			1
<i>Ventricolaria isocardia</i> (Verrill)			2	2	1
<i>Petricola</i> species		1			

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
TELLINACEA					
<i>Tellina (Elliptotellina) pacifica</i> Dall		1		6	
<i>Tellina (Eurytellina) species</i>		1	1		
<i>Tellina (Eurytellina) inaequistriata</i> Donovan			1		
<i>Tellina (Merisca) meropsis</i> Dall				1	
<i>Tellina (Merisca) proclivis</i> Hertlein and Strong		1	5		1
<i>Tellina (Merisca) reclusa</i> Dall	3	3	1	2	14
<i>Tellina (Moerella) amianta</i> Dall	2	2	13	2	
# <i>Tellina (Moerella) felix</i> Hanley			1		
<i>Tellina (Moerella) paziana</i> Dall					1
<i>Tellina (Moerella) new species</i>		5	1		
<i>Tellina (Phyllodina) pristiphora</i> Dall					9
<i>Tellina (Tellinella) cumingii</i> Hanley	1	2	1		
<i>Tellina (Tellinella) zacae</i> Hertlein and Strong				1	
<i>Macoma siliqua</i> (C.B. Adams)					1
<i>Gari regularis</i> (Carpenter)			2	1	
<i>Solecurtus guaymasensis</i> Lowe			1		
<i>Tagelus politus</i> (Carpenter)	1	2			
# <i>Semele mediamericana</i> Pilsbry and Lowe				2	
<i>Semele pacifica</i> Dall	1	2	5	4	3
<i>Cumingia lamellosa</i> Sowerby	1	1			
MYACEA					
<i>Corbula biradiata</i> Sowerby			4		
<i>Corbula luteola</i> Carpenter	1			2	
<i>Corbula nasuta</i> Sowerby	1			5	11
<i>Corbula speciosa</i> Reeve	1	2	*9	11	21
<i>Corbula species indeterminate</i>			3		4
? <i>Gastrochaena ovata</i> Sowerby				2	
PHOLADACEA					
# <i>Xylophaga mexicana</i> Dall			1		

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
PANDORACEA					
<i>Pandora cornuta</i> C. B. Adams				1	
<i>Pandora granulata</i> Dall			5		
<i>Pandora uncifera</i> Pilsbry and Lowe			3	4	
<i>Lyonsia gouldii</i> Dall	1		9		1
# <i>Asthenothaerus villosior</i> Carpenter		1			1
<i>Cyathodonta undulata</i> Conrad				1	
POROMYACEA					
<i>Cuspidaria dulcis</i> Pilsbry and Lowe			4		
# <i>Cuspidaria lanieri</i> Hertlein and Strong					5
<i>Plectodon scaber</i> Carpenter			3	1	3
<i>Verticordia ornata</i> (Orbigny)					1
SCAPHOPODA					
DENTALIIDAE					
<i>Dentalium hancocki</i> Emerson		8	3		
<i>Dentalium inversum</i> Deshayes				*3	
<i>Dentalium oerstedii</i> Mörch					5
<i>Dentalium quadrangulare</i> Sowerby			7	4	1
<i>Dentalium semipolitum</i>	1				
Broderip and Sowerby					
<i>Dentalium splendidum</i> Sowerby	4	*6	5		8
# <i>Dentalium tesseragonum</i> Sowerby				2	
GASTROPODA					
PATELLACEA					
<i>Acmaea semirubida</i> Dall		1			
<i>Acmaea strongiana</i> Hertlein		1			
<i>Nomaeopelta stanfordiana</i> (Berry)				1	
PLEUROTOMARIACEA					
<i>Scissurella</i> species			5	1	
TROCHACEA					
<i>Arene</i> new species			1		
<i>Arene rammata</i> (Dall)		1			

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
TROCHACEA (Continued)					
<i>Liotia acuticostata</i> Carpenter				3	
<i>Liotia acuticostata stearnsi</i> Dall		3	2		
<i>Solariella triplostephanus</i> Dall			6	3	
<i>Tegula byroniana</i> (Wood)			1		
<i>Tricolia typica</i> (Dall)			1		
<i>Tricolia</i> species			1		
<i>Turbo squamiger</i> Reeve					
FISSURELLACEA					
<i>Diodora inaequalis</i> (Sowerby)	2	2	2	1	3
<i>Diodora saturnalis</i> (Carpenter)				3	
<i>Hemitoma hermosa</i> Lowe	1	3	1	3	
<i>Lucapinella</i> new species?				3	
LITTORINACEA					
<i>Lacuna</i> species			5		
RISSEOACEA					
<i>Alleorus deprellus</i> Strong		1	1		
<i>Alvania</i> species		10	16	7	7
<i>Amphithalamus</i> species					1
<i>Barleeia</i> species			15	45	
<i>Cyclostremiscus tricarinatus</i> (C. B. Adams)					1
<i>Rissoella</i> species					3
<i>Rissoina</i> species		7		1	
<i>Solariorbis (Hapalorbis) liriopae</i> Bartsch					3
<i>Solariorbis (Hapalorbis) seminudus</i> (C. B. Adams)					1
<i>Teinostoma</i> species				1	
<i>Vitrinella</i> species			1		
ARCHITECTONICACEA					
<i>Architectonica nobilis</i> Röding	1				2
<i>Heliacus bicanaliculatus</i> (Valenciennes)		1			
<i>Heliacus</i> species		2	5	2	

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
CERITHIACEA					
<i>Alaba supralirata</i> (Carpenter)		15			
<i>Alaba</i> species		2	15		
<i>Alabina diomedae</i> Bartsch		3			
<i>Cerithiopsis</i> species		10	11		
<i>Cerithium gemmatum</i> (Hinds)		1	1		
<i>Caecum</i> species		5	6		2
<i>Elephantanellum</i> species				2	
<i>Elephantulum</i> species				1	1
<i>Fartulum</i> cf. <i>F. laeve</i> (C. B. Adams)			15		
<i>Metaxia convexa</i> (Carpenter)		3	9		
<i>Metaxia</i> species				1	
<i>Modulus catenulatus</i> (Philippi)			6	4	
<i>Modulus cerodes</i> (A. Adams)		7	4	2	
<i>Seila assimilata</i> (C. B. Adams)		3	1	1	
<i>Triphora</i> species	2	5	8	9	
<i>Turritella mariana</i> Dall			*31	*32	2
<i>Turritella nodulosa</i> King and Broderip			3	9	
<i>Petalconchus</i> (<i>Macrophragma</i>) <i>indentatus</i> (Carpenter)		1			
<i>Petalconchus</i> (<i>Macrophragma</i>) <i>indentatus</i> variety		1			
<i>Vermetus</i> (<i>Thylacodus</i>) species				1	
EPITONIACEA					
<i>Epitonium</i> (<i>Asperiscala</i>) <i>walkerianum</i> Hertlein and Strong	2				
<i>Epitonium</i> (<i>Nitidiscala</i>) <i>wurtsbaughi</i> Hertlein and Strong		1			
<i>Epitonium</i> species		1			
<i>Scalina ferminiana</i> (Dall)				1	
EULIMACEA					
<i>Balcis</i> species (possibly <i>Eulima</i>)				1	
<i>Balcis</i> species	1		5		4
<i>Niso excolpa</i> Bartsch				4	

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
HIPPONICACEA					
<i>Hipponix antiquatus</i> (Linnaeus)				1	
# <i>Hipponix grayanus</i> Menke		*30		2	
CALYPTRAEACEA					
<i>Calyptrea conica</i> Broderip					8
<i>Calyptrea mamillaris</i> Broderip			11	7	30
<i>Cheilea cepacea</i> (Broderip)		1	1		
<i>Crepidula aculeata</i> (Gmelin)					20
<i>Crepidula arenata</i> Broderip		1	1	4	
<i>Crepidula excavata</i> (Broderip)			3	7	
<i>Crepidula striolata</i> Menke					3
# <i>Crucibulum concameratum</i> Reeve					3
<i>Crucibulum scutellatum</i> (Wood)		1	1	1	2
<i>Crucibulum spinosum</i> (Sowerby)	1	2	1	1	
LAMELLARIACEA					
<i>Erato columbella</i> Menke	2				
CYPRAEACEA					
<i>Trivia californiana</i> (Gray)				1	
<i>Trivia sanguinea</i> (Sowerby)			1	2	
STROMBACEA					
<i>Strombus gracilior</i> Sowerby			33	8	
<i>Strombus granulatus</i> Swainson	6	2	27	5	1
NITICACEA					
<i>Natica grayi</i> Philippi			1		
<i>Natica idiopoma</i> Pilsbry and Lowe			1	2	
<i>Natica (Stigmaulax) broderipiana</i> Récluz				1	
<i>Polinices bifasciatus</i> (Gray)			1	1	
<i>Polinices uber</i> (Valenciennes)	*10	*34	14	4	3
<i>Polinices species</i>					2
<i>Sinum debile</i> (Gould)	1		1		
ATLANTACEA					
# <i>Atlanta species</i>				1	2
TONNACEA					
<i>Colubraria siphonata</i> (Reeve)					1
<i>Cymatium gibbosum</i> (Broderip)		1			

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
TONNACEA (Continued)					
<i>Cymatium tigrinum</i> (Broderip)					1
<i>Ficus ventricosa</i> (Sowerby)					1
MURICACEA					
# <i>Aspella pyramidalis</i> (Broderip)				1	
<i>Morula lugubris</i> (C. B. Adams)		1	1		
<i>Murex recurvirostris</i> Broderip					6
<i>Ocenebra parva</i> (E.A. Smith)				1	
<i>Pterynotus centrifuga</i> (Hinds)					3
BUCCINACEA					
<i>Anachis coronata</i> (Sowerby)			1		
<i>Anachis coronata hannana</i> Hertlein and Strong				1	
? <i>Strombina carmencita</i> Lowe			4	2	4
<i>Strombina maculosa</i> (Sowerby)	*15	*66	*70	*39	3
<i>Cantharus pallidus</i> (Broderip and Sowerby)			2	3	5 1
<i>Engina reevei</i> Tryon				2	
<i>Engina solida</i> (Dall)		1	1	4	
# <i>Metula amosi</i> Vanatta					1
<i>Phos veraguensis</i> Hinds					3
<i>Nassarius angulicostis</i> (Pilsbry and Lowe)	*3		20	3	
<i>Nassarius gallegosi</i> Hertlein and Strong		1	2	1	
<i>Nassarius versicolor</i> (C. B. Adams)		7	5	6	
<i>Nassarius (Arcularia) tiarula</i> (Kiener)	*2				
<i>Nassarius cf. Nassarius mendicus</i> (Gould)				1	
<i>Nassarius</i> , ? new species				2	
# <i>Fusinus irregularis</i> (Grabau)				1	2
# <i>Fusinus panamensis</i> Dall					1
<i>Fusinus</i> species			1		
VOLUTACEA					
<i>Cancellaria buccinoides</i> Sowerby					1
<i>Marginella californica</i> Tomlin	7	1	1		2

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
VOLUTACEA (Continued)					
<i>Marginella (Cypraeolina) species</i>			3		
<i>Marginella (Cystiscus) species</i>		1			
<i>Marginella (Gibberulina) species</i>		1	4		
<i>Oliva spicata</i> (Röding)	*15	*73	*32	3	
<i>Olivella alba</i> (Marrat in Sowerby)			3		
<i>Olivella dama</i> (Wood)			3		
<i>Olivella gracilis</i> (Broderip and Sowerby)			1		
<i>Olivella tergina</i> (Duclos)				1	
MITRACEA					
<i>Mitra crenata</i> Broderip			4	6	
<i>Mitra dolorosa</i> Dall		2	3		
<i>Mitra mexicana</i> Dall					2
<i>Mitra (Tiara) hindsii</i> Reeve			5	9	11
<i>Mitra (Tiara) sulcata</i> Sowerby					1
CONACEA					
<i>Clathrodrillia alcestitis</i> Dall				3	
<i>Clathrodrillia haliplexa</i> Dall		1			
<i>Clathrodrillia pilsbryi</i> Lowe				1	1
<i>Clathurella candida</i> (Hinds)					4
<i>Clathurella</i> cf. <i>Clathurella serrata</i> Carpenter		1			
<i>Clathurella rava</i> (Hinds)			1		
<i>Clathurella</i> species			1		
# <i>Clavus acapulcanus</i> (Lowe)				2	1
# <i>Clavus alcmene</i> (Dall)				3	
<i>Clavus asaedai</i> (Hertlein and Strong)				1	
# <i>Clavus melea</i> (Dall)				2	
# <i>Clavus pilsbryi</i> (Bartsch)		2			
# <i>Clavus plicatellus</i> (Dall)					2
# <i>Clavus pudicus</i> (Hinds)				1	
# <i>Clavus roseolus</i> (Hertlein and Strong)				1	1
# <i>Clavus turveri</i> (Hertlein and Strong)				1	1
<i>Clavus</i> species			4	2	

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED)				
	DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
CONACEA (Continued)					
<i>Crassispira ericana</i> Hertlein and Strong					2
<i>Crassispira</i> cf. <i>Crassispira incrassata</i> (Sowerby)					1
<i>Crassispira martinensis</i> Dall			1		
<i>Crassispira tepocana</i> Dall			1		
<i>Gemmula hindsiana</i> Berry					1
# <i>Mangelia cyrene</i> (Dall)				1	1
<i>Mangelia occata</i> (Hinds)					1
<i>Mangelia trichodes</i> (Dall)	1	3	2	2	
<i>Mangelia</i> species		1	4	1	1
<i>Pleuroliria oxytropis</i> (Sowerby)			1	1	
<i>Pleuroliria oxytropis albicarinata</i> (Sowerby)			1	5	15
<i>Pleuroliria picta</i> (Reeve)			5	9	
# <i>Syntomodrillia cybele</i> Pilsbry and Lowe		1			
<i>Tenaturris burchi</i> (Hertlein and Strong)	2		1	1	
<i>Tenaturris verdensis</i> (Dall)				2	
<i>Turricula libya</i> Dall					2
<i>Turricula nigricans</i> Dall					1
Turridae, undetermined; possibly new genus, new species			3	3	
# <i>Conus bartschi</i> Hanna and Strong				1	
<i>Conus gradatus</i> Wood	2	1			
<i>Conus recurvus</i> Broderip					1
<i>Conus scalaris</i> Valenciennes			1	4	6
<i>Terebra ?albocincta</i> (Carpenter)				1	
<i>Terebra armillata</i> Hinds		1		3	
<i>Terebra intertincta</i> Hinds			1		
# <i>Terebra lingualis</i> Hinds				1	
# <i>Terebra panamensis</i> Dall			3		
<i>Terebra specillata</i> Hinds				2	
<i>Terebra variegata</i> Gray				6	
<i>Terebra</i> species					1

LIST 4. Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
PYRAMIDELLACEA					
<i>Odostomia (Miralda) exarata</i> Carpenter		2			
<i>Odostomia (Miralda)</i> species			2		
<i>Odostomia (Scalenostoma) dotella</i> Dall and Bartsch					1
<i>Odostomia</i> species			1		
<i>Pyramidella adamsi</i> Carpenter	3	1	2		
<i>Pyramidella auricoma</i> Dall		1	2		
<i>Pyramidella (Voluspa)</i> new species	2				
<i>Triptychus</i> new species				1	
<i>Turbonilla (Careliopsis) stenogyra</i> Dall and Bartsch			1		
<i>Turbonilla (Careliopsis)</i> species				2	
<i>Turbonilla (Mormula) coyotensis</i> Hanna and Strong		1	4	1	
<i>Turbonilla</i> species		5	3	1	15
BULLACEA					
# <i>Atys casta</i> Carpenter		3			
<i>Atys chimera</i> Baker and Hanna				1	
<i>Bulla punctulata</i> A. Adams	12	9	5		
<i>Bulla</i> species		5			
<i>Haminoea angelensis</i> Baker and Hanna		2			
<i>Haminoea</i> species		1			
? <i>Sulcoretusa</i> species					2
<i>Volvulella</i> species					1
SCAPHANDRACEA					
<i>Acteocina angustior</i> Baker and Hanna	3	6	1		
<i>Cylichnella</i> species		5	9		
PTEROPODA					
<i>Cavolina trispinosa</i> Lesueur		1			
<i>Cavolina</i> species					1
<i>Clio</i> species				1	

LIST 4. (Continued)

SPECIES	NO. OF SPECIMENS (STATIONS GROUPED) DEPTH IN FATHOMS				
	1-3	3-12	10-18	14-25	30-50
SIPHONARIACEA					
# <i>Siphonaria brannani</i> Stearns			1		
<i>Williamia peltoides</i> (Carpenter)	2			5	
UMBRACULACEA					
<i>Umbraculum ovale</i> (Carpenter)				1	

LIST 5. Polyplacophora (Chitons) from Isla Espíritu Santo and
Isla Partida, Baja California, Mexico.

ISCHNOCHITONIDAE

Ischnochiton (Radsiaella) tridentatus Pilsbry - Abundant.*Lepidozona serrata* (Carpenter) - Fairly common.*Stenoplax mariposa* Dall - Fairly common.

CHAETOPLEURIDAE

Chaetopleura lurida (Sowerby) - Common.

CHITONIDAE

Chiton virgulatus Sowerby - Common.

ACANTHOCHITONIDAE

Acanthochitona exquisita (Pilsbry).

The above list is based on specimens in the collection of the California Academy of Sciences. More intense collecting in the area would undoubtedly add more species to it.

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